CLAIMS

1. Fully emptiable tube provided with a wall resistant to stress-cracking and forming a water barrier, this tube essentially comprising a flexible skirt (1) and a head (2), the skirt (1) being elongate in an axial direction (XX') and having, at one end (121) of the tube, a filling end (121) sealed by crushing this skirt (1) along a transverse direction (ZZ') and the head (2) comprising at least one evacuation orifice (3) and a flexible neck (4) forming a radial extension of the orifice (3) and connecting with the skirt (1), at least the skirt and neck forming a single-piece assembly, the wall at the joining of the neck with the skirt in a longitudinal plane (L1) containing axial direction (XX') and perpendicular to the transverse direction (ZZ') having a determined joining radius (R4), and the skirt (1) in a transverse plane (T) to the axial direction (XX') and at mid-distance between the end (123) of neck (4) forming the orifice (3) and the filling end (121) of the tube having a determined perimeter (C1) and a substantially constant wall thickness, the ratio (C1/R4) of the determined perimeter (C1) to the joining radius (R4) being at least equal to 4.5, characterized in that its wall in plane (T) has a median thickness (E) of between 0.30 mm and 1.20 mm, preferably between 0.30 mm and 1.00 mm, in that it consists of a mixture of a number "n" at least equal to 1 of polymers belonging to the family of copolymers-olefins prepared from C_2 to C_{10} monomers, in that at least a first polymer of the mixture belongs to the polypropylene family, and in that the constituent mixture of the tube wall has a flexural modulus of no more than 700 MPa, preferably no more than 500 MPa according to standard NF EN ISO 178.

2. Tube as in claim 1, characterized in that the first polymer is a heterophase copolymer of propylene and ethylene.

3. Tube as in any of the preceding claims, characterized in that it contains a second polymer consisting of a heterophase copolymer of propylene and ethylene.

4. Tube as in either of claims 1 and 2, characterized in that it contains a second polymer consisting of a linear C_4-C_{10} copolymer of ethylene-olefin.

5. Tube as in any of the preceding claims, characterized in that the constituent mixture of the tube wall has a flexural modulus of between 100 and 350 MPa, preferably between 150 and 300 MPa, according to standard NF EN ISO 178.

6. Tube as in any of the preceding claims, characterized in that the length (H), defined as the distance between the end (123) of neck (4) and the filling end (121) along axis XX', is between 40 mm and 170 mm, and in that the wall in plane (T) has a median thickness (E) preferably equal to the square root of the length (H) corrected by a multiplier coefficient of between 0.045 and 0.065, this multiplier coefficient further preferably being between 0.050 and 0.060.

7. Tube as in any of the preceding claims, characterized in that the ratio (C1/R4) of the determined perimeter (C1) to the joining radius (R4) is less than 3 and preferably between 0.5 and 2.

8. Tube as in any of the preceding claims, characterized in that the neck (4), with respect to the axial direction (XX'), has a maximum incline (A) of no more than 35°, preferably no more than 30°.

9. Tube as in any of the preceding claims, characterized in that the skirt (1), before sealing the filling end (121), is defined by a generatrix (G) non-parallel to the axial direction (XX').

10. Tube as in claim 9, characterized in that the generatrix (G) of the skirt (1), before sealing the filling end (121), has a maximum incline (B) of no more than 2° with respect to the axial direction (XX') and preferably in the region of 0.5°.

11. Tube as in either of claims 9 and 10, characterized in that before sealing the end (121) of the skirt, the generatrix (G) of the skirt (1) is a straight line.

12. Tube as in any of the preceding claims, combined with claim 6, characterized in that the skirt (1), as far as its joining with the neck (4), has a wall thickness having a first value (E1) that is substantially constant and substantially identical to the median thickness (E), in that the neck (4) in the vicinity of its end (123) forming the evacuation orifice (3) has a wall thickness having a second value (E2) greater than the first value (E1), and in that the wall thickness of the neck decreases gradually from the second value (E2) to the first value (E1) from end (123) to a point (D) of neck (4) located at a determined distance (d) from the join between the neck (4) and skirt (1).

13. Tube as in claim 12, characterized in that the ratio of the second wall thickness value (E2) to the first wall thickness value (E1) is no more than 1.5.

14. Tube as in any of the preceding claims, characterized in that the tube is coated with a barrier varnish over its entire surface including the neck (4).

15. Tube as in any of the preceding claims, characterized in that it is obtained by injecting into an injection mould comprising a core (6) and an impression (7), the core itself comprising a central part (10) of which one free end (11) centre bears upon the impression (7) at least during the tube skirt injection phase.

16. Tube as in claim 15, characterized in that, the free end (11) of the central part (10) of the core comprising supply channels (12), it has an apex wall at its injection end (122) formed at least in part of sectors (32) corresponding to the supply channels (12).

17. Tube as in either of claims 15 or 16, characterized in that the central part (10) of the core (6) of the injection mould is mobile, and in that the apex wall of end (122) of the tube is formed without any gaps, after drawing backwardly the mobile central part (10) over a distance corresponding to the desired thickness for this apex wall.

18. Tube as in any of claims 15 to 17, characterized in that the free end (11) of the central part (10) of the core is in the shape of a sunken cone, the angle (γ) formed by the bearing surface of this free end (11) on impression (7) with the plane perpendicular to the longitudinal axis (XX') of the tube being less than 45°, preferably between 15° and 20°.

19. Tube as in any of claims 15 to 17, characterized in that the free end (11) of the central part (10) of the core is in the shape of a projecting cone frustum, the angle (β) formed by the bearing surface of the projecting cone frustum of this free end (11) on impression (7) with the plane perpendicular to the longitudinal axis (XX') of the tube lying between 35° and 45°.

20. Tube as in claim 19, characterized in that the free end (11) of the central part (10) of the core is in the shape of a sunken cone in its part internal to the projecting cone frustum, the angle (δ) formed by the bearing surface of the sunken cone of this free end (11) on impression (7) with the plane perpendicular to the longitudinal axis (XX') of the tube being less than 45°, preferably between 15° and 20°.

21. Tube as in any of claims 15 to 20 combined with claim 17, characterized in that the head comprises single-piece securing means of nozzle type (5), and a single-piece reducer (9), the nozzle and reducer being positioned in the continuation of orifice (3) along axis XX', the apex wall (122) of the nozzle forming the reducer (9), the orifice (8) of the reducer being obtained by cutting after forming the tube by injection, the tube, nozzle and reducer thereby forming a single-piece assembly formed by injection in a single operation.

22. Tube as in any of the preceding claims combined with claim 21, characterized in that it is provided with capping means (35) provided with a tip (27) of conical shape, in that the tip enters into the orifice (8) of the single-piece reducer (9), in that that the tip places the wall of the reducer (9) under centrifugal radial (25) tension in the vicinity of the opening orifice (8).

23. Tube as in any of claims 15 to 20, characterized in that the head comprises single-piece securing means of nozzle type (5) positioned in the continuation of orifice (3) along axis XX', the tube and the securing means (5) forming a single-piece assembly formed by injection in a single operation.

24. Tube as in either of claims 21 or 23, characterized in that the wall of the single-piece nozzle (5) carries an asymmetric thread (19).

25. Tube as in any of claims 1 to 20, 23 and 24, characterized in that it is provided with an added accessory of dispensing type of added reducer (36) or added nozzle tip type, or securing means of added nozzle type forming a reducer (37) or nozzle tip type, or capping means of service cap type (38), the added accessory being positioned in the continuation of orifice (3) along axis XX'.

26. Tube as in claim 25, characterized in that the added accessory (36), (37) or (38) is provided with a chimney (21) of which an outer face is conjugated with the face (29) parallel to axis XX' of orifice (3), after inserting the chimney (21) inside the orifice (3).

27. Tube as in claim 26, characterized in that the chimney (21) of the added accessory places the wall of orifice (3) under centrifugal radial tension (25).

28. Tube as in claim 26, characterized in that the added accessory is non-removable and in that the chimney (21) of the added accessory is provided with a penetration device of conical shape (22), the outer face of the chimney being radially recessed (23) with respect to the penetration device (22).

29. Tube as in any of the preceding claims, characterized in that the determined perimeter (C1) of the skirt (1) in the transverse plane (T) lies between 75 mm and 190 mm.

30. Tube as in any of the preceding claims, characterized in that the neck, in the longitudinal plane (L1), has a radius of curvature that increases continuously in a direction leading from the evacuation orifice towards the skirt.

31. Method for fabricating a flexible, fully emptiable tube consisting of a skirt and a head comprising at least one evacuation orifice and a neck forming a radial extension of the orifice and being joined to the skirt, the skirt and the neck forming a single-piece assembly resistant to stress-cracking and forming a water barrier, characterized in that it comprises the steps consisting of:

- using as constituent material of the wall a mixture of a number "n" at least equal to 1 of polymers belonging to the

family of copolymers-olefins prepared from C_2 to C_{10} monomers, a first polymer belonging to the polypropylene family, the mixture of polymers having a flexural modulus of no more than 700 MPa, preferably no more than 500 MPa, the wall having a thickness of between 0.30 and 1.20 mm, preferably between 0.30 and 1.00 mm,

- fabricating the skirt and head of the tube by injecting the mixture, in a single injection operation, into an injection mould comprising an impression (7) and a core (6), said core comprising a central part (10) of which one free upper end (11) centre bears upon the impression (7) at least during the skirt injection phase.